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ENVIRONMENTAL SAMPLING PROJECT TASK FORCE

LAWRENCE BERKELEY NATIONAL LABORATORY

MEETING

AUGUST 10, 2000

REPORTER'S TRANSCRIPT OF PROCEEDINGS

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A P P E A R A N C E S:

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Task Force Members: Nabil Al-Hadithy, Eric Arens, Gene Bernardi, Pamela Evans, Evelyn Fisher, Amy Kyle, Paul Lavely, Sue Markland Day, Keith Matthews, David McGraw, David Miller, Miriam Ng, Dick Nolan, Fran Packard, Terry Powell, Pamela Sihvola, Chris Whipple, Carroll Williams, Periann Wood.

Presenters: Bernd Franke, F. Owen Hoffman, Ph.D.

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BE IT REMEMBERED that on Thursday, August 10, 2000, commencing at the hour of 8:38 p.m. at 2345 Channing Way, Berkeley, California, JOANNA FILDS, a duly qualified Certified Shorthand Reporter, License No. 10959, in and for the State of California, reported the following proceedings.

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PROCEEDINGS

MS. REINEMAN: I'd like to call the meeting to order. We will start with the public commentary. Irmi Meindl is the first person for public comment.

MS. GEORGE: Here we are in this meeting. It looks very formal. It looks like a real meeting. It looks like something is actually going to happen here, there is a formal process, and that the public is somehow involved.

But, you know, the truth is, I'm afraid, that that is just an illusion. And what's really going on here is that we're here to give this impression of community involvement, and we can say whatever we want to say, and then LBNL will go off and do exactly what they want to do. Is that right?

So in some ways I really don't know what we're doing here. And I don't suppose we'll stick around with this process a whole lot longer, but there is some value to being able to speak to each other and to be able to ask

some questions of the Lab.

And finally the Lab has been starting to release documents, which they have not been willing to do for many, many, many years. So there is some progress, I guess, being made.

But the truth is there is a process going on here that is they're trying to get our agreement on a phony sampling plan that they hope will prevent the Environmental Protection Agency from listing the Lab as a Superfund site.

That is the bottom line here, their sampling plan, that is what this Task Force is all about, and that is what the Tritium Issues Working Group was also all about, was to try to get the community's rubber stamp on a phony plan for not finding the tritium that is up there.

Now, you asked how do I know this. Well, I've been putting together a contamination chronicle of Lawrence Berkeley National Lab. It's 12 pages long, it's seventy years long. The National Tritium Labeling Facility was put together originally on -- the tritium operations went on on the campus in the Melvin Calvin lab. They are apparently still going on there too, right near a day care center for UC kids.

There have been releases near the Lab measured over the limits for permissible levels of tritium. Nothing has

been done about it. Up on the hill, where the National Tritium Labeling Facility is now located, they were releasing tritium at alarming rates through the 'eighties, through the whole early 'nineties, and then all of a sudden they stopped for a couple of years at a time -- oh, anyway, it's all here, folks.

MS. REINEMAN: John Selawsky, please.

MR. SELAWSKY: Good evening. My name is John Selawsky. Just for purposes of representation I do not represent CEAC tonight. I am chair of the Community Environmental Advisory Commission here in the City of Berkeley.

I guess I pretend to know what I'm talking about, therefore. I would like to comment on a couple of things here. First I want to comment briefly on Bernd Franke's initial report, which I found very critical of Lab operations and assessment and evaluation up on the hill here in Berkeley.

I was very troubled and actually somewhat affronted by the Lab's reaction and attempt to spin that report in its own good favor and good view. I find that somewhat despicable, quite honestly.

Bernd Franke's report, in so many words, stated that the Lab has not done a sufficient job in evaluating and assessing what's going up on the hill there to the

point where they can make any categorical statement about the safety or non-safety of what is happening. And yet the Lab insists that everything is hunky dory and everything is safe.

I think people need to reread Bernd Franke's report. I think particularly lab officials need to reread that report and take it seriously this time.

Secondly, I'd like to comment in relation to that on the National Academy of Sciences survey and report that came out just a few days ago on the AP Wire Service indicating that the Berkeley Lab is one of well over a hundred sites in this country that will never be open to public use. Never, as it stands now, because of past legacy contamination.

I find it -- I find it just incredibly very, very difficult to deal with the Lab here in Berkeley. And I find it an affront to me as a human being who cares about the environment and as a Berkeley resident who cares about the people around myself here in Berkeley, that the Lab is so cavalier in its attitude toward the community.

And that's the one thing that gets me time and time again, the arrogance of the Lab in relation to community relationships. I was on the Tritium Issues Work Group. I saw it there at every meeting, and I was appalled at the attitude and the arrogance of the Lab officials and the

regulatory bodies as well.

I would like to also comment very briefly and state in my opinion that any consideration of finalizing a sampling plan at this point is inappropriate and very premature. I'll wrap it up. Thank you.

In light of Bernd Franke's report, final report is not due yet, is not out yet, and that Bernd Franke has been hired as a contractor by the City of Berkeley to inform this process and to help the Lab in its evaluation and assessment, I really think that you need to wait and get Bernd Franke's input and the citizens of the community of Berkeley's input before any sampling plan is finalized. Thank you.

MS. REINEMAN: L.A. Wood, please.

MR. WOOD: I too, along with John Selawsky, spent 27 months with the Tritium Issues Work Group, and I guess I can pretend to know something too about this process. About a month and a half to two months ago I raised the issue about the central campus. This is a process that is so convoluted that we can't even get the scientists to flush out the problems for us. We first have to define the question, identify the target, and then someone will make a comment to it.

I'm referring to Calvin Lab, and the comment that I wrote in the paper a couple of months ago. I had

Mr. McGraw, the focus of this effort here tonight, criticize me for stepping out and talking about tritium releases at the Calvin Lab. My goodness, it couldn't have happened. Quite obviously it did.

I sent that article along with a couple others that I wrote to Bernd Franke and asked him the same questions that I was asking the newspaper about an environmental monitoring program, about an environmental program at the Lab. I call it the stealth program. And I do believe it's still stealth. It is one of those things that over the last decade that we've had to put up with.

Everybody recognizes and have recognized for over a decade that we've been deficient in our environmental monitoring. Yet it's taken this task force and this community to this point to force the issue. And the issue isn't whether or not we're going to spend an awful lot of money to monitor a radiation shack on the hill.

I wonder when sometime in this process the cost effectiveness of government kicks into place and we start measuring what we're doing and its cost.

And I don't want to let the EPA off because I believe they contribute heavily to this. I will acknowledge that in some ways they are a stepchild in this process, but, in fact, the Bernd Franke report says one very clear thing to me, and maybe you didn't read it in

the report.

It said that U.S. EPA's regulatory oversight to the Hill is deficient, it's not right. And for me it sends a signal -- you know, the first report that we've had that we've paid for that, we've had that expressed, that notion of a major deficiency, a current one. And what I'm hoping what we can do is to change that and change that whole process.

And for the U.S. EPA I think we should hold them accountable and we should change the regulatory oversight. We need to look at the standard, how the standard is being applied up there, and ask some very serious questions of DOE and U.S. EPA in conjunction as to how they structured the operation up there.

It's not the permit but it's a process, a standard process that we need to hold them accountable to. And I do believe that U.S. EPA had a very, very difficult time in doing that. And as a consequence you see the numbers that Bernd Franke talks about in 1985 with Calvin Lab.

I beg you to go back another decade. And again, I will repeat in closing, that this process is an absolute sham. I'm embarrassed to be here tonight.

MS. REINEMAN: Cynthia Johnson.

MS. MENCHACA: My name is Leticia Menchaca. I live in Berkeley. I used to work at the Lawrence Berkeley

National Laboratory. I am going to be very, very brief in what I want to say.

I frankly don't understand why it is that we cannot have a serious study on the tritium distribution in the site or in Berkeley. I think it should be -- I think any of the scientists that work at the Laboratory would do it right away with very little resources.

It's just peanuts for anybody who is there because everybody is very capable. What I think is the problem is that it's a problem of trust. And I frankly think that the Environment Health and Safety Division, who is a lot of the personnel from that division, is present right now, and are perfectly capable of doing their work.

But their work is compliance with the regulations, not protection of the public, not scientific study, not a scientific study, not a thorough investigation. And that's what they do. So I don't understand what is the problem if the money is there, if the resources are there.

Why can't the public or the Laboratory leave it open for scientists to compete for real study of not only tritium distribution but whatever it is, the contaminant that worries the public.

I live in Berkeley and I worry. And I worry not because the things that are there are going to kill me, but because I know that if there is something dangerous

there I don't expect the administration to tell me. They will never do it because that's not their job.

Their job is to look good on paper and comply with the regulations and be congratulated for what they do on paper. And "the least they know the better off they are." Thank you very much.

MS. REINEMAN: Janet Arnold.

MS. ARNOLD: I'd like to defer to Barbara George, if she has more to say. She's very well informed and it seemed she didn't have enough time to finish her presentation.

MS. GEORGE: One of the things that I found really shocking about this story is that when the measurements were made that were over the limit, and I'm talking way over the limit -- I mean, in one case there were several hundred curies released, and many times there were five, ten, twenty times over the limit of the maximum permissible in air and drinking water that were released at the Lab.

But the really shocking thing is what happens after those measurements are taken from the monitoring stations up at the Lab. The monitor is suddenly not there anymore, or it's moved to the other side of the building upwind, or people who were measuring the tritium, like Leticia, who just spoke, they were let go, their contract was not

renewed.

That happened to her, it happened to Susan Monheit. As soon as you see the big numbers, boom, the monitors are gone, the people are gone. That's the way they operate this laboratory. It's really scary.

And that is what I think is going to happen with this tritium sampling plan, that it is not going to be a real sampling plan. And there are a lot of reasons why you can see that it really is not a real sampling plan.

So I just want to say, I don't think that the Lab has any basis to go forward with this plan. It's time to just put it in the wastebasket where it belongs. To get a real sampling plan, like Dr. Menchaca was talking about, would not be that difficult, and it's time to do a site-wide survey of all of the problems there, radiation, as well as the chemical problems.

And that is what I hope is going to come out of this meeting today, is we are going to forget the tritium sampling plan that they have and move forward to something real.

MS. REINEMAN: C. Fred?

MR. FRED: Thank you. My name is Clifford Fred. I've lived in Berkeley 25 years. I'm very impressed with all the work and study that the previous speakers have done. I would just like to urge the Lawrence Berkeley

National Laboratory, the University of California, and the Department of Energy to shut down and dismantle the National Tritium Labeling Facility and to pay for an independent thorough cleanup of any tritium contamination on this site.

I should note that the Berkeley City Council has asked for the facility to be closed, and I urge you to do so. The health risk is simply too great for such a heavily populated area near the Hayward fault. Thank you very much.

MS. REINEMAN: This is Marion Fulk.

MR. FULK: At this stage I don't have much to criticize or say for in favor of the sampling plan. I'm not sure I know what it is. All I want is to get honest numbers and proper interpretation of the data.

The people have become aware of the serious threat of tritium. It is much worse than what you think it is. The things that I have read make very little sense. They do a Ouija Board calculation, and I don't know whose Ouija Board they use.

They're not checkable, they don't tell you what the assumptions are, and they always want to report it in rems. Between a rad and a rem there is a fudge factor. It leaves lots of leeway for fudging.

Furthermore they don't really take into account the

biological effects of one of the more lethal components of tritium when it disintegrates, when that little nuclear bomb goes off, besides the electron that goes off at an average of about 6,000 electron volts, the helium 3 is born with a temperature somewhere in the order of 2000 degrees Kelvin.

Also it is one of the worst oxidizing agents in the world, and it has the ability to suck out electrons completely over many hundreds of angstroms to the tune of about 24 electron volts.

All of these things are not considered. Furthermore they want to convince you that the only thing that happens to you during radiation exposure is cancer. Well, that's nonsense. There are more radiation damages to the DNA in the nucleus than one can shake a stick at. And when you see one there are probably 10,000 others.

Now the things you have to address in the exposure of tritium besides the threat to the unborn children and to the unborn female, which work was done at the University at Livermore, a good piece of work, one has to worry about, in older people, the tritium influence of Alzheimer's, Parkinson's, Huntington's, all cardiovascular problems.

I know it's funny, but it's not. This is in addition to immune system results, diabetes, these are

probably all connected to a serious form of damage that has only been recognized in the last few years, in addition to the genetic instability problem, which is never ever addressed. But there is a good reference work by about five people, first author is Marvin, University of California. Read it and weep.

Also there is another little phenomenon which is not taken into account, and that's the bystander effect.

MS. REINEMAN: Lauren Ritter, please.

MR. ARENS: Hi. I am Eric Arens, and I sat in at the last meeting for Evelyn Fisher, who was out of town. Since April I've been the president of the Campus Parnassus Neighborhood Group, which is the neighborhood on the north side of LBNL, the closest neighborhood there.

And before the last meeting in June here, I handed out three questions that I had asked we might settle by that time, and I asked for answers at this meeting, which I hope that they will come.

Since then I have thought up a few more questions that I've had and put them down on paper, because there isn't time to ask them here, and I also do talk to the neighborhood about it because it's -- that's my job.

And so I have given Evelyn some of these things to hand out. I have ten more here, if I can think of any people here who want to have them.

Now, let me -- the last page of these papers here sort of summarizes everything. One is of the NIMBY effect, that's Not In My Backyard.

LBNL built the tritium facility in its backyard. It used to be the corporation yard where they had the construction materials.

They built it up there on the down side of LBNL, and then they built a pipe underground that goes up the hill into the eucalyptus, and that's where the stack is. This is an unusual place to put a piece of laboratory equipment.

So, anyway, the tritium that comes out gets blown over the fence. It doesn't go into LBNL's backyard but someone else's backyard. That's bothersome. Just that that happened is bothersome.

Secondly, the monitors, I mean records, other people have talked about that, that the monitor -- that the monitoring hasn't been done well, it's erratic, not continuous.

I might mention here that I'm monitoring -- every person in the University of California Berkeley campus here who has a radioactive source that is used in its research has to have that source periodically checked by some LBNL people, and you have to pay for that. And these sources are often measured in microcurie, that's a

millionth of a curie.

LBNL's tritium is kilo-curies, and they don't check themselves nearly as carefully as people with the microcuries are. Okay. Anyway, that's -- I'll hand these things out here, what I've got here, and these are questions that I would like to have answered in addition to the three things I handed out last time.

MS. DOUGHERTY: Thank you to all of the speakers from the public. We appreciate your comments. And for each of you who spoke, please remember, if you will leave copies up on the front desk so people can pick up whatever it is that you have talked about so people can pick up your handouts. The desk back there, that is available for that.

Let me start with some announcements. The first announcement is for you Task Force members. We have a new court reporter tonight, Joanna, who is not as familiar with you. And so we will try and for her sake call out your names. And be respectful to her. She's trying to capture the data today for today's transcript. So, Joanna, welcome, and we will try really hard to do that.

The second comment I have is it was brought to our attention by a member of the Task Force that we have been inconsistent as facilitators -- have been inconsistent in managing Task Force members and not -- responding to

public comment.

And so we want to note that we would ask all Task Force members, when the members of the public are commenting, please be respectful and allow them their time to make their comments and we will be more consistent about that.

And, again, we will ask for the same as Task Force members are talking. We will ask the public to be respectful as well. And Owen is here, and Bernd, are you on the telephone?

MR. FRANKE: Yes, I am.

MS. DOUGHERTY: Hi Bernd, welcome. Bernd Franke is joining us on the telephone.

And Owen, for you guys too, it was pointed out that we were allowing you guys to speak during public comment. So we will ask that you let the public have their say and not interrupt them. And we would like to be consistent about that.

Another announcement we have for you guys, you have quite a few handouts. Do you want to give me a copy of that too so I can talk about it? And I'll go through all the handouts. Thank you.

So we have a series of handouts in front of you. One of them is called a draft summary of topical common areas on the tritium sampling plan. This document is

prepared at your request, Task Force members, to give you a summary. Some of you have asked how are we capturing everything that is said, how are we capturing the data and the comments.

This document is a brief summary of what the transcripts recall and say that you guys have given as comments to the sampling plan today.

And it's a topical summary. It's not utterly absolutely complete. You are welcome to add to this. As a matter of fact, we encourage you, please, if you find things that are not on this list please add them. We'll be delighted to have them.

But it's a first shot at going through the transcript and capturing your comments and the comments of the public as they are recorded in the transcript.

MS. DUFFY: I believe it's posted on the Website.

MS. DOUGHERTY: Thank you. Another thing you have in front of you is a letter from Michael Rochette -- or to Michael Rochette from the Regional Water Quality Control Board. You left us last time with an action item, a question that a number of you Task Force members asked, that the Regional Water Quality Control Board be consulted and involved in this process.

You have a letter here that specifically deals with some of the questions you had. And they have been invited

to add a member to this Task Force and they have yet to respond. So we're waiting for their response on that.

The next letter you have is from U.S. EPA to Nabil. And this is a document that refers to Bernd's report. So Bernd, EPA has responded to your report. I'm not sure if you've seen this document, but we'll make sure you get a copy. It's signed by Mike Bandrowski.

Next Pamela passed out -- is this what Ms. George had, Pam? This is what I asked Ms. George about when she was speaking. If you didn't get a copy of it, the Task Force members have it and to members of the public, it's available.

MS. DUFFY: Did you get things passed out?

MS. DOUGHERTY: A couple of other comments we've had, the comments table, I think I said to you guys already, please be sure and add to them. We have a whole pile of stuff in front of you. Do you guys want to look at those documents and ask me anything? Because -- we'll take your questions. If not, what we have on tonight at your request is the reports, the verbal reports from the two consultants to this process.

Bernd Franke goes first. Bernd, you have about thirty minutes when we start. And then Owen Hoffman. The way we will handle these comments so you guys can all get a chance to hear the two consultants is we ask that you

please get out a pencil and paper and record your comments as the process goes along so we can stay in contact with Bernd and not have too much interruption for him.

And the same thing for Owen. So Bernd will speak, Owen will speak, and then we will have full conversation available for the Task Force. Pamela has something.

MS. SIHVOLA: I wanted to suggest something for the benefit of the audience. There are many people who have not been to these meetings before. And I would like everyone around the table to introduce themselves and the organization that they represent.

MS. DOUGHERTY: Thank you, Pamela. That is a good reminder. So we can do that. And it will also help our court reporter, Joanna. Thank you. Miriam, can we start with you?

MS. NG: Miriam Ng, I represent the Berkeley Association of Realtors.

DR. HOFFMAN: Owen Hoffman. I'm from Oakridge, Tennessee, where I am in charge of an environmental consulting firm centered in Oakridge, SENES Oakridge Center for Risk Analysis, and I'm currently a consultant for the Lawrence Berkeley Laboratory.

MS. EVANS: And I'm Pamela Evans with the Alameda County Public Health Department.

MR. MCGRAW: And I'm David McGraw, a Task Force

member, and I represent the Lawrence Berkeley Laboratory.

MS. PACKARD: I'm Fran Packard, and I represent the League of Women Voters of Berkeley, Albany and Emeryville.

DR. WILLIAMS: I'm Carroll Williams, and I represent the Panoramic Neighborhood Association.

MR. WHIPPLE: I'm Chris Whipple, and I represent the Oakland Chamber of Commerce.

MS. WOOD: I'm Periann Wood, and I represent the U.S. Environmental Protection Agency.

MR. NOLAN: My name is Dick Nolan, and I represent the United States Department of Energy.

MS. FISHER: Evelyn Fisher, and I represent the Campus Parnassuss Neighborhood Association.

MR. AL-HADITHY: Nabil Al-Hadithy, City of Berkeley Toxics, representing city managers.

MS. MARKLAND DAY: Sue Markland Day. I am the president of the Bay Area Bioscience Center, which is -- the University and the biotech companies, who would be considered users of tritium.

MS. SIHVOLA: My name is Pamela Sihvola, and I'm sitting here for Gene Bernardi, co-chair of the Committee to Minimize Toxic Waste.

MR. MATTHEWS: Keith Matthews, City of Oakland Fire Department, Hazardous Materials Inspection Unit.

MR. LAVELY: Paul Lavely, University of California

campus.

MS. KYLE: Amy Kyle, School of Public Health, U.C. Berkeley.

MS. DOUGHERTY: I'm Sheryllyn Dougherty. This is Pat Duffy, and we are facilitating the meeting. We have one last document we want to comment on. I think two meetings ago a member of the public raised some 30 questions that parents had asked regarding the sampling plan, and that was distributed and posted on the Web.

And one of the documents you have in front of you is a response to -- or will be, I'm sorry, it is not there now. It will be a response to those thirty questions. We did not want you to think that we had forgotten. That was two months ago. It will be posted on the Web within the next ten days or so, that response.

And Eric -- I saw you speak earlier. Eric, I'm sorry, just to comment to you, because of the tight nature of time we have to get the reports from Bernd and we may not get to your questions tonight. Just so that you know that, because it is a report night. Thank you.

In that case, does anybody have anything at the table they want to bring up before we talk to Bernd?

Bernd, we're going to get Nabil here. He's going to be running Bernd's slides for us. Bernd, you're on. You have thirty minutes, and we're going to time you.

MR. FRANKE: Good evening.

MS. DOUGHERTY: Do you want us to give you reminders when you're twenty minutes in?

MR. FRANKE: Oh, yes. I've written down -- there is an echo which maybe can lower what I hear in the background. So this is the first long presentation that I'm doing here, and I'm really talking long distance, so bear with me. I know that Nabil has the slide show in front.

MS. DOUGHERTY: Bernd, I'm sorry to interrupt you. Can you try and speak a little bit louder and clearer into the phone so the people in the audience can hear? I'm not sure everyone can hear you so well.

MR. FRANKE: Okay. I have numbered the slides, Nabil, so if I'm referring to a slide I just refer to the number. And since I cannot see you I want to make sure that I'm talking about what you see also.

So I am presenting my preliminary technical report for the City of Berkeley, and of course this goes beyond what the plan is envisioning.

When we started this in September -- and I'm doing this together with Tony Greenhouse, who unfortunately cannot be here tonight -- we identified four areas of concern for the City of Berkeley and the residents.

One -- and if you can show the second slide,

Nabil -- is the concern about the current operations. With current operations I refer to those in between 1998 and today.

Number two, the second area of concern, is about legacy contamination from past operations. And the third concern is about historical exposures, everything which happened before 1998, in my opinion.

And there are risk-related concerns. And this is the fourth category. Now I, of course, know that I was trying to get a lot into the limited contract, and bear with me that what you see today is only a preliminary view of my analysis. But I've tried to be as concise as possible.

The third slide, please. In the first category, about current operations, one of the concerns regards the tritium inventory. And the question I asked is is the tritium inventory at NTLF adequately determined.

Of course there has been some concern about the adequacy of the inventory, and I reviewed the inventory data, its accuracy and its relevance to determine the amount of impacts of the National Tritium Labeling Facility.

What did I find? I found that the current estimate of the tritium inventory at NTLF was about 13,000 curies. It's not very precise. It's associated with substantial

error.

That error has something like plus or minus 30 percent. Why is that so? It has to do with the type of measurements which the laboratory can do to determine the inventory, which does not allow to verify the releases into the environment from the inventory data.

The inventory data, on the other hand, isn't really thought to allow the verification of releases. It is an analytical problem that the accuracy is limited.

And I don't believe there will ever be a time that one can do that, and it is certainly not meant to be. So I feel that there are two lessons to be learned from the inventory issue.

One is that certainly it would be desirable to improve the accuracy of the measurements conducted relating to the inventory. But on the other hand that the only way to determine how much has been released is not relying on the inventory but to actually measure the releases into the environment.

The next slide please, number four. This shows the reported tritium inventory at NTLF in the top line. In relation to that you see the bottom line referring to the reported airborne releases of tritium.

And you see that there is a factor of a hundred or more difference between the two. That means that we

only -- in order to verify the releases of airborne tritium one would need to be extremely accurate in the tritium inventory, and I don't believe that effort can be achieved.

And it certainly -- I have to repeat myself -- isn't really the design of the inventory. That is not what the inventory is all about.

The fifth slide, please. The next question I looked into was were releases of airborne tritium adequately monitored. And I reviewed data on stack releases and I evaluated the internal consistency and uncertainties of that data. What did I find?

I found first that for the current operations the measurements which are done to determine how much tritium leaves back with the silica gel sampling system for HTO, for waterbound tritium appears to be reliable. I spot-checked the data and found that the calculations matched.

I also found that for 1998 the non-HTO releases, the ones of elementary tritium, are uncertain. At that time NTLF didn't really have the proper monitoring in place for the silica gel sampling of non-HTO. So they relied on real-time data, which is sampled with a system called the Overhoff system, an ionization chamber, and that system is by design not very suitable to verify the

source to measure the silica gel system.

The reason for that is simply that the detection of that system is very high, which is not surprising because they're an online system and they don't integrate over time.

However when in 1998 NTLF relied on Overhoffs to estimate non-HTO releases, one has to say that that estimate was associated with a substantial error.

Does it matter very much? It does not really have great concern for me because the non-HTO releases are essentially elementary tritium and are not as toxic as the HTO.

However, for 1998, of course, that error should be taken into account. The most important finding, in my opinion, from this review is that the Overhoff data, the real-time data, indicates that tritium is often released from NTLF in very short events, in bursts.

For example, in 1998 I reviewed two years of Overhoff's real-time data. I didn't look at every second here. I picked a few samples.

And I found that in 1998, on March 25, 0.2 curies of HTO were released over a period of a thousand seconds, which is roughly 15 minutes.

Why is it important? It is important because the NESHAP, the EPA's compliance system for the NTLF, assumes

that the releases are actually continuous in its nature and that the releases occur spread out over the year -- and that the modeling of the releases are not that way.

I believe that that is a severe limitation of the current way compliance is being shown, and that like in many other facilities in the country, this issue has been debated, and my suggestion is that the discontinuous nature of NTLF releases be taken into account.

If I can have slide number six.

MR. AL-HADITHY: Just to clarify that HTO is water?

MR. FRANKE: Yes. Thank you, by the way, Nabil. This shows you what I'm talking about. This is a sample graph for March 25, 1998, and it indicates on the vertical line that you have a spike of tritium releases in the afternoon of that day, and therefore you have to take into account the spike type of release.

Bear in mind the vertical scale is logarithmic. So between each line there is a factor of ten difference. And I believe this is definitely something which the laboratory should take into account.

And I understand that we talked about the laboratory's attempt to come to some conclusion with regard to the discontinuous nature of the releases.

Slide number seven. The next question I looked into is phrased: Is tritium in air measured at the right

location. And this is a tricky one because where would you have potentially effective locations and where should one actually sample?

There are, of course, quite a number of ways to determine how the best locations can be selected. And I looked into the various approaches. And what I found is number one, that the very discontinuous nature which you have seen before of the releases, in my opinion does not allow to restrict sampling of environmental ambient air to the major wind directions only.

Because these bursts don't behave like NTLF bursts. They are happening when they happen, and the wind blows the material at a time that you cannot really predict. So bearing that in mind I believe that it is prudent to improve and to expand in that work for tritium. And in order to look into the adequacy of that recommendation I reviewed what other DOE facilities do about tritium monitoring.

And I find that other DOE facilities with similar amounts of tritium emissions monitor at least ambient air in 16 wind directions. With wind directions I'm talking about the 22.5-degree sectors north, north northwest, northwest and so forth. And I recommend this design for LBNL as well.

If I can have slide number eight you see a table

which indicates the facilities I reviewed, the 1998 reported tritium releases from those facilities, and the third column, the number of ambient air stations, and the fourth column, the calculated dose for the maximally exposed individual at those facilities from all radionuclides and sources combined.

And you see that Lawrence Berkeley Lab have 115 curies of tritium releases. It's about in the middle of the other facilities, central, so to speak. There is Pantex, which has much less.

The Lawrence Livermore laboratory has similar emissions in 1998. Savannah River Site is much, much more, but the exposed people live much further away.

So the dose of the maximally-exposed individual at Savannah River is actually smaller than the one at the Berkeley Lab. And you'll see that all other facilities have a much larger number of stations.

So does that mean there is a law of physics which defines which stations should be monitored? Certainly there isn't. But there is a precedent for this case, and the reasonability of this recommendation, I believe, should be discussed. And I believe -- and it would be prudent to do so, given the concern of the public at this facility.

Slide number nine, please. I then looked into the

sampling and analysis of tritium in the air in a given location. I reviewed observed versus expected water collected in silica gel samples, and I will talk to that in a minute.

I reviewed the results of split-sampling programs and I reviewed the contract laboratory performance. What did I find? Number one, the analytical data for HTO, which is tritiated water in ambient air samples, appeared to be verifiable.

I found that the uncertainty of those samples at the Lawrence Hall of Science is less than 20 percent, and that I could verify the way the concentrations were calculated from the laboratory reports which have been given to me and all the accompanying data.

On that basis I find that there is no evidence to suggest for me that at the measured locations exposures exceeded radiation doses of 10 millirems per year, which is the legal limit, because the concentrations measured were much smaller than those which you would need to have to get 10 millirems per year.

I believe that I should report this because that is what I find. There is some small uncertainly in the analytical data, which I believe should be incorporated in the reports. It's a scientific process, I guess, that one really should report those as well.

And one of the small items which I found was that the amount of water collected in the silica gel should be determined from the sample weight difference rather than from the amount of water distilled at the laboratory. Now that has to be explained, I guess.

The next slide, number ten, please. This shows a comparison of the tritium split-sampling program by EPA and LBNL for samples measured at the Lawrence Hall of Science. Then you see that those samples match relatively well. There is uncertainty, of course. Not every sample comes back with an identical result when you do a split sampling. And that is where this uncertainty of plus-minus 20 percent comes from. But in the process I feel confident this is a good sampling program.

Next slide, on the left, please. This shows the observed and expected water collected at one of the environmental sampling stations. And what one should know about this is that when you collect water in air you do this at the laboratory environment with silica gel, which sucks up the water. And then the water is being distilled in the laboratory and this chart compares the amount of water distilled in the laboratory with the amount of water one would expect from the meteorological monitoring.

So the solid line shows the extracted water and the dotted line shows the expected water. And one sees that

in some samples the extracted water actually is larger than the expected water, which could be explained by the fact that the silica gel is loaded initially with some water.

So what I'm suggesting here is to actually report that weight difference and to look into the magnitude of that potential error, which I believe is not very large. But just to mark a small point, that should be corrected as well.

The next slide, please. Then I looked into the draft sampling -- the draft tritium sampling plan and asked myself is that sufficient to determine the extent and nature of legacy contamination at NTLF?

I reviewed the sampling plan regarding sampling media, locations, analytic techniques and quality assurance/quality control issues. What did I find? I have to repeat my previous finding regarding ambient air monitoring.

I believe it would be prudent to increase the monitoring to cover all 16 wind directions as part of the overall sampling improvement. Whether that ultimately will be taken into account by the EPA I don't know. But I think the sampling should not just do what EPA wants as a result but also take into account recommendations and concerns in the community. And I believe there is a valid

concern, and I think that is one way of addressing it.

I looked into the soil sampling of the environment around NTLF, and I find that it would be better to use the HASL-300 core method for soil sampling and also to increase the depth increments which will be analyzed.

What do I mean by HASL-300? That is essentially the Environmental Measurements Laboratory's recommendation for sampling, which is a DOE facility in New York. And they are recommending to not just take one core at a given sampling location but take about ten cores and to then split those cores and mix them up just to avoid a bias in soil sampling.

Because one has some variability in a given location. This is actually the preferred method. And whenever I do environmental sampling plans I certainly prefer the HASL-300 method because it allows for a much better unbiased sample than a single core, which I believe was the intent to use in the draft tritium sampling plan.

Why do I recommend additional depth increments? Well, essentially just to get the full picture and not just to limit the soil sampling to some smaller depth increment. I believe it would be prudent to have the entire depth increment to be sampled and analyzed so the question can be answered how far the contamination may have spread.

I also recommend that the sampling of groundwater should be coordinated with the Regional Water Quality Control Board, and that this definitely, in my opinion, is the appropriate agency to determine what should be done about this.

I also recommend that an additional issue be looked into, and that is the Building 3, the Calvin Lab, because historical data for ambient air measurements indicates that the Building 3 has had concentrations which may be comparable with the Lawrence Hall of Science, the NTLF surroundings.

And if I can have the next slide, I can tell you why.

MR. AL-HADITHY: You have eight minutes left, Bernd.

MR. FRANKE: Yes. I should be done in eight minutes. I don't know which version of my presentation you have here, Nabil. Is that the last one which I mailed to you this morning?

MR. AL-HADITHY: I think so, yes.

MR. FRANKE: And there are three bars here, and the third bar is somewhat similar to the second bar; is that right?

MR. AL-HADITHY: Yes.

MR. FRANKE: This shows you what I mean about the

Lab. I plotted the time-integrated concentration of tritiated water and air for all the years spanning from 1972 to 1999. And you see that the first column is -- the first bar indicates what has been measured very close to the NTLF. The second column shows you what has been measured at the Lawrence Hall of Science, and the third column shows you what has been measured at the Building 3 roof.

There are uncertainties, of course, associated with all of these measurements. All I'm saying here is that the data at face value indicates similar concentrations, and I believe that in order to get this issue resolved some additional -- some initial sampling of the soils in the vicinity of Building 3 would be prudent to determine whether there is any contamination at all. And then we can go on from that basis.

Next slide, please, number 14. Which other factors need to be addressed in EPA's evaluation of the Superfund status for the NTLF site and what other non-radiological data is important. What did I find and recommend?

Number one, I believe that the sampling report would include a section describing NTLF operations during the sampling time when the results are recorded so that one can really make up their mind as to whether the operation was typical and what influence the operation may

have had on the reported concentration.

And I also believe that the EPA will provide information as to how the hazard ranking score would change if the Lawrence Hall of Science would be regarded as a school, accounting for the student population.

What do I mean by that? The hazard ranking system is a mathematical operation which takes into account concentrations of measured tritium in air and other environmental media and then also accounts for the number of people which are potentially affected.

And as far as I understand they have the ranking system that the number of students in schools are to be counted and, of course, many may make the determination that Lawrence Hall of Science is not a school, it is obviously correct in making that observation.

However, I also know that a lot of people visit Lawrence Hall of Science, and it would just be prudent to make a calculation, taking into account the average number of visitors at the Lawrence Hall of Science, and to count them as students and just to see what effect that calculation has on it. I believe this is something straightforward which should not be too complicated.

Next slide, please. Coming to the historical exposures which, of course, go beyond now. We spoke of the current sampling plan, I felt that there are two areas

of concern. One is the exposures to neutron and gamma radiation from LBNL operations.

And I reviewed the historical data on those and found that neutron and gamma doses at various locations at the LBNL site were substantially larger than today. Current doses are reported to be on the order of less than 1 millirem a year.

However, peak exposures in the late 'fifties, early 'sixties may actually have exceeded the then-prevailing limit of 500 millirem a year when one uses the historical conversion factors. I'm not entirely sure what the legal limits were. At the time I asked LBNL to determine the historical limit. It's quite a process to go back and get the documents from the archives.

It goes back to the process of how the limits were determined in 1959. That issue can be resolved, I believe. It certainly needs to be looked into. And we feel, Tony Greenhouse and I feel, that the doses were substantial and that the doses would warrant that one have a closer look at what has happened to the nearby residents, what kind of cumulative doses these may have encountered, when one takes uncertainties of these doses into account and the contribution from all sources and pathways.

Why do I recommend that? I believe one should know

that similar efforts of looking into individual exposures in the vicinity of DOE sites have been done at other facilities where doses were similar to those reported to LBNL.

If I can have slide 16. You can see that this is showing the way the doses from neutron and gamma have been reported and calculated over the years at the Olympus Gate station, which is a little north from the Lawrence Hall of Science.

And the annual equivalent here is given in millisieverts per year. And we see that if you multiply those by 100, those numbers at the left side, then you get the millirems per year. And you see that in 1959 and 1960 the peak doses were observed in the order of a few hundred millirems, so cumulative doses at that site were in the order of a few rem, and I believe this warrants a closer look at the overall impact of that operation over the past.

Next slide, please. I also looked into exposures which resulted from past releases from tritium and reviewed the historical data on tritium emissions in environmental concentrations.

And I found that, number one, at face value the concentrations do not appear to have exceeded then-prevailing limits. One should take that into

account. We are talking about concentration below the prevailing limits. Limits have changed over time. So we need to also look at the correlation of the concentrations and reported releases, and I will show you a slide relating to that.

And I feel that there is not a good correlation between observed concentrations and reported releases. And that is why I recommend to review the accuracy of the data and to evaluate the data in light of the fact that pre-1995 measurements in general are considered to be unreliable because of lack of appropriate quality control at that time.

And, therefore, one should, in context of the reconstruction effort I recommended, look into all of these uncertainties and determine what overall impact this may have had on people around LBNL.

In that context I also have to reiterate that the historical data which I showed before suggests that concentrations around Building 3 on the U.C. campus indicate concentrations of tritium in air which warrant some initial soil sampling.

The next slide, please. This is the slide indicating what I mean with a lack of correlation between reported releases and ambient air concentrations. The black line indicates the reported release of tritium from

LBNL in curies per year, and those dots and triangles refer to the concentrations measured at the Lawrence Hall of Science at the Building 3 roof and at the Olympus Gate.

And I have to correct one slide in my initial report. In 1985 I made an error. The Building 3 concentration actually was lower than I showed at that initial slide in my report. I apologize for that. I just mixed up two numbers when I transferred them.

So the peak concentrations at Building 3 and also at Lawrence Hall of Science and Olympus Gate were actually reported in the late '70s, so '77, '78, '79. And I believe it is quite puzzling that, number one, we have similar concentrations at the Lawrence Hall of Science and the Olympus Gate, even though those two locations are quite a distance apart.

And there are many explanations for that observation. One has to do with the uncertainty of the analytical procedures at the time. And I cannot resolve this at this point. I believe this should be looked into.

Number 19, please. This compares the annual tritium releases from LBNL and the concentrations measured at Lawrence Hall of Science that one sees, that at a given annual release of tritium the reported concentrations at Lawrence Hall of Science are actually quite variable, and I believe this indeed may indicate the effect that I was

talking about at the very beginning, that we don't have continuous releases over the year, but we have discontinuous releases.

So this uncertainty should definitely be taken into account. However, at the location of the Lawrence Hall of Science, what you measure in the air is what you measure. If you actually measure at the areas potentially affected, these uncertainties can be properly taken into account.

As I come to my concluding remarks I would like to stress -- slide number 20, please -- that the reported results are preliminary in nature and my findings are subject to revision. I will incorporate the comments which will be received into the draft final report to the City of Berkeley.

I would also like to stress that the absence of proof is not the proof of absence. It was my job, I believe, to report about what I can see and also to report if I don't see anything of concern. And that is why I said that I didn't find any evidence of concentrations over the last few years that suggest concentrations above the 10 millirem per year limit.

However, I would also like to stress that having seen what has been reported about my findings that the quotation of two sentences doesn't really tell the full story. But I do not feel that it is my job to get

involved in the political debate in your area.

I feel that I should use my limited resources in this project, and I'm really thankful to the City of Berkeley for their assistance here to continue to review and discuss the technical merits of the issues at hand with all parties involved. And I'm really looking forward to a fruitful discussion tonight. Thank you so much.

MS. DOUGHERTY: Thank you so much, Bernd.

We want to go ahead and have you write down your comments and capture them all. Owen is going to make his presentation. And then, Bernd, you and Owen will just be taking questions from the Task Force as they come up in the next 30 minutes.

MR. FRANKE: Okay.

MS. DOUGHERTY: Thank you very much.

DR. HOFFMAN: I'm Owen Hoffman. I'm a consultant to Berkeley Lab. I'm an environmental scientist by training. I run the SENES Oakridge Center for Risk Analysis. I hope I have a reputation nationwide for being a straight shooter.

As I looked into performing a health risk assessment for sporadic releases of tritium from the National Tritium Labeling Facility's hillside stack, I consulted with Tore Straume, formerly of Livermore Lab, and some of you know him as the person who looked into the

issue of the biological effect of tritium.

And I told him that I'm trying to be rigid, to tell things straight. And what Tore told me is: You're going to get in trouble. Because by telling it straight, you're going to make both sides angry at you.

Be that as it may, that's the background behind which I'm going to make this presentation in terms of summarizing comments from the preliminary technical report that Bernd just summarized. But also going into my attempt to analyze the significance of these short-term discrete emissions that I have determined from analyzing the Overhoff real-time sampling data from the National Tritium Labeling Facility's hillside stack.

Now, I want to say this, as I've looked at Bernd's report in detail, I find it to be a fair and objective analysis. Some of the comments that I'm going to make are comments reflecting my opinion on some of the statements that appear in his report.

The first thing is is tritium in air measured in appropriate locations. I believe in terms of compliance with EPA specifications, yes, they are.

In terms of are they in a position to verify every emission from the facility, no, they are not. But what is done in backup is verification of the stacks, with limited or no opportunity for releases coming from places other

than the stacks, and then using mathematical models to make projections in those locations that are not covered by off-site monitors. Is there a plan to increase the number of sampling stations? Yes, there is.

How many sampling stations are necessary? That's part of the dialogue that's going on here. And I think the ultimate decision will be a product of that dialogue. Should stations just be simply placed out at random to cover all 16 sectors?

My recommendation is that careful thought be given to the technical merit of each sampling station so that the value of information gained at each station is carefully considered before making the commitment to place such a station in a particular location.

Are releases of tritium from the NTLF stacks reliably monitored? I agree with everything that Bernd just said, that in terms of the biologically relevant species of tritium, tritium water vapor, the monitoring is reliable.

In terms of the more difficult to determine tritiated hydrogen gas that is not readily taken into the human body and that is not readily taken into biological substances, that has much less radiotoxins than tritiated water vapor, there are difficulties. And these difficulties have been identified, and the ultimate

improvements have been implemented as late as last year.

Does it make a difference? What the Lab currently does is assume that every molecule of tritiated gas that's released will eventually form into tritiated water vapor and simply add the two together to provide at least a pessimistic viewpoint as to what the potential off-site exposures are going to be.

Is the tritium inventory at the National Tritium Labeling Facility determined with sufficient precision to accurately estimate releases? And the answer is of course not. The answer is it never has been and it isn't today and it never will be.

Now why is that? Even with the best state-of-the-art equipment we have why can't we use inventory estimates to estimate and verify how much has been released? The answer is because it releases such a very small fraction of that inventory.

And the level of precision that would be needed to use inventory data to make these calculations is beyond the reach, at least of our current state-of-the-art technology.

Is the sampling and analysis plan designed to determine the extent and nature of legacy contamination at the NTLF? I don't know how many of the Task Force members here have looked into this issue, but I would just like to

say that my answer to this is no. It is not.

Why isn't it? It's because the sampling plan is focussed on detecting what the environmental concentrations are that reflect current day operations of the facility. I'm sorry.

MS. DUFFY: Excuse me, would you please let him talk?

DR. HOFFMAN: The sampling plan is currently focussed on determining environmental concentrations that reflect current day operations of the facility. In order to get a clear picture of the legacy contamination of this facility, samples would have to be taken when the facility is in a dormant state of operation so that contamination in soil, in groundwater, in the air clearly reflect the cumulative legacy of what has occurred in the past.

That's not currently part of --

MS. DOUGHERTY: It's really important for the Task Force members that you hear what Dr. Hoffman has to say and that we be respectful of Bernd's time on the telephone. If people have something to say there will be a time to say it later.

Once again, I want you to be equally respectful of each other and to Bernd and Owen in their presentations. And I thank you.

DR. HOFFMAN: One of the difficulties is as a child

that was born with a stutter, when attacked from the audience that old tendency comes back. So if you'll bear with me as I try to focus my attention on the thoughts that I had prepared I'll try to articulate the information that I want to present to you on this. I believe that the issue in terms of Superfund evaluation is the need to determine whether or not there is an issue out there that warrants cleanup.

It is my expectation that if legacy contamination were to be the focus of the sampling and analysis plan, that the residual levels of tritiated water vapor and organically-bound tritium would be so low that it wouldn't warrant merit in terms of a hazard ranking score.

Bernd has raised the issue of the hazard ranking score and how it should be applied to the site. EPA has also addressed this question so that even if the Lawrence Hall of Science were to be considered a school it wouldn't affect the hazard ranking score.

But I would like to say this. Having looked into the letter of the law, having consulted with the Office of Radiation Programs, EPA in Washington, D.C., I believe personally -- and this has nothing to do with my relationship with the Lab, it has to do with my personal evaluation of the law -- that in this case I don't see how CERCLA can possibly be applied to the current-day

operations of NTLF.

CERCLA is designed to apply to legacy contamination. Yet the samples that are being taken are samples that reflect current-day operations. So I believe that in this case this is a misuse of the Superfund law in terms of its application to the operations of NTLF.

What were the exposures that resulted from past LBNL operations? I think every issue that Bernd has raised is valid. I think there are issues out there that need to be addressed. The Lab is currently addressing these in terms of the need for soil sampling around Building 3 in terms of looking at past releases of tritium, and especially looking at the need for more realistic dose calculations associated with the past operation of the accelerators.

And, in fact, Gary Zeman informs me that those calculations will be completed sometime in the near future, and by near future I'm saying at least the next ninety days or so.

What I have focussed on primarily is the importance of short-term routine emissions of tritiated water vapor from the National Tritium Labeling Facility. This is the major issue that was identified in Bernd's report. And what I've tried to do is to bring to bear the most recent scientifically defensible techniques that I know of to

evaluate the significance of these short-term emissions.

The objective is to evaluate the magnitude of the short-term emissions, to estimate air concentrations of tritiated water vapor off-site that would be estimated using a meteorological model that is appropriate for complex terrain and discrete release events, to get away from the traditional use of models that are designed only for regulatory compliance calculations.

And also to estimate exposure and potential health risk resulting from these short-term events, expressing uncertainty explicitly in all steps of the calculation. One of the things we in my organization take pride in is the complete expression of our state of knowledge as a confidence.

So instead of giving you one number I'm going to give you a range, and that range reflects our state of knowledge, our confidence. The true but unknown number should be somewhere in between the lower and upper bound.

Basically there are three scenarios that we are addressing, a typical single visit or a typical set of multiple random visits by a child to the Lawrence Hall of Science, a reasonable maximum visit, assuming that the visit coincides with the highest release recorded during the last two years associated with the hillside stack and associated with normal operation of the NTLF, and

coincidental with the wind blowing in the general direction of that receptor.

The last calculation is going to the hypothetical extreme, assuming that the extreme worst combinations of meteorological hourly conditions prevail during the time of the highest routine release recorded over the last two years and seeing what the effects are of this implausible combination of events on the overall exposure.

The last two scenarios we have, we have a visit to the Lawrence Hall of Science taken into account and also an individual exercising vigorously right near the NTLF hillside stack at the location of the site boundary fence.

The methodology we've used is nonstandard. It is advanced. It is not something that the regulators would use. It's the methodology we use at SENES Oakridge Center for Risk Analysis.

Much of this has been derived from work we're currently doing with the National Cancer Institute to update the 1985 radioepidemiological tables. First we use the mathematical model called CALPUFF, which is actually a system of computer codes, to estimate air concentrations for two conditions, a two-and-a-half hour visit at the Lawrence Hall of Science or a series of two-and-a-half hour visits to the Lawrence Hall of Science or a 15-minute period at the boundary fence where someone is exercising

vigorously and breathing air much greater than what would normally be assumed for a regulatory compliance calculation.

The conversion from the inhalation and skin absorption of tritiated water vapor into the body into an estimated organ dose for every organ site in the body is taken from the International Commission of Radiological Protection.

And imposed upon that is an uncertainty. The details of much of this is summarized in tables that are appended to the handouts of this talk. Marion Fulk is here, and the last time I met Marion Fulk he asked me about my thoughts on the relative biological effects of tritium.

I gave him my thoughts during that meeting, which is I thought it ranged somewhere from one to five. In this estimate, however, I've relied a lot on the knowledge of Dr. Tore Straume, now with the University of Utah and formerly of Lawrence Livermore National Lab.

He confirms that we don't really know what the relative biological effectiveness is, but the state of knowledge indicates it's somewhere between one and five with perhaps a best estimate or a central estimate at two. So that's what's been assumed in this assessment. It is two times higher, two times more radiotoxic than a similar

dose of X-rays.

The information about radiogenic cancer incidence is based on the most recent information available from the Radiation Effects Research Foundation from Japan, the most recent information available about what it takes to extrapolate that unique information to a member of the U.S. population, with uncertainties associated with numerous steps in the calculation and then adjusted for the background incidence rates of cancer incidence specific to the Bay Area.

Now what I would like to point out is that most estimates you've seen in the past have dealt with mortality as the end point or cancer death. This is unique in that it deals with the incidence of cancer. So the risk will be somewhat higher than you've seen in the past in terms of risk per unit dose.

The state of knowledge for each variable is considered explicitly as uncertainty, and probability distributions are used in calculation so that errors can mathematically be propagated throughout the computer calculations.

The first result is for a typical two-and-a-half hour visit to the Lawrence Hall of Science for a five-year-old female. Now, in your packet the tables deal with males and females and individuals of different ages.

You have that there.

In this presentation I'm going to focus on the one that gives the highest combination of results, and that would be a five-year-old female. However, the difference, as you will see, is not too large between a child being exposed and the exposure of an adult. The result is that the central estimate of dose and the central estimate of excess lifetime risk for a typical visit is zero.

Why? Because most of the time the wind is not blowing towards the Lawrence Hall of Science during the daytime hours. And so it's only the upper bound of confidence that registers a positive value, and these positive values are small fractions of a millirem, and in an excess lifetime risk that's a tiny fraction of a chance in a million.

So basically what this says is for a typical visit I can't claim there is much of a risk at all from visiting the Lawrence Hall of Science. Now although most people may go once or twice to the Lawrence Hall of Science, what about a hundred visits?

For a hundred visits the probability is much greater of intercepting the winds that are blowing in the direction of that facility. So that increases the probability of exposure.

When you increase the probability of exposure it

increases the probability of a dose, and now you can see that even the lower bounds of the central estimate and the upper bound of the uncertainty range gives you a positive dose estimate but still a small, small fraction of a millirem. And risk estimates that are small fractions of chances in a million, in fact, these are so small that I would have difficulty saying that they're distinguishable from zero.

In my handouts I also have the results for the reasonable maximum, but in the interest of time I'm going to bypass that and go all the way to the hypothetical extreme where we assume that there is the extreme worst case combination of meteorological conditions prevailing during the time of the highest 2.5 hour release of HTO.

It is specified at 409 millicuries. This is a value somewhat higher than was assumed or was reported in Bernd's report. This is the highest emission from the stack at the hillside that has been recorded over the past two years since the result of normal operations of the facility.

Again, small fractions of a millirem, dose estimates that are small fractions of a chance in a million, in fact, these are -- these are on the order of 10 to 18 chances in a billion.

MR. MATTHEWS: How long a visit?

DR. HOFFMAN: Two and a half hours. The other extreme situation is a 20-year-old female engages in vigorous exercise for 15 minutes continuously near the NTLF hillside stack which is located at the end of the trail that comes to the site boundary, the closest place where one plausibly could come in and do such exercise.

Now we're assuming the extreme worst combination of meteorological conditions during the time of the highest 15-minute pulse release. In this case in 15 minutes the assumption is on the order of 218 millicuries released. This is the highest 15-minute release recorded over the past two years as a result of normal operations.

Again, in this case, somewhat higher than for the individual exposed to a one-time visit for the Lawrence Hall of Science, but not much, perhaps a factor of two higher.

Again, fractions of a millirem of exposure, fractions of chances in a million in terms of risk, these risk estimates that are this low, they're negligible, I personally have a hard time saying that they are distinguishable from zero.

There is no way that an epidemiological program is going to be able to detect exposures at this level. How much more time? I'm almost there. I'm recovering from a high heart rate that some members of the audience have

induced.

Calculating the risk and giving you mathematical numbers is no way to say that the risks are really higher or lower or indifferent. Ultimately the evaluation of risk is a personal judgment.

Each individual has a personal judgment to make. Now in society we sometimes let regulators make those judgments for us, but I feel obligated, after giving you these numbers, to at least give you some information that you can use to put risk into perspective.

What I'm going to do is to use the concept of a thermometer whereby at the top is absolute certainty. And each increment from the top gives you a factor of ten incrementally lower risks.

So the first line is one chance in ten, the second is one chance in a hundred, the third one in a thousand, one in 10,000, one in 100,000, one in a million risk and then below that. For Superfund sites EPA target risk range is usually somewhere between one chance in 10,000 and one chance in a million.

Usually at most sites where the evaluation comes out less than one in 10 thousand cleanup is seldom undertaken.

Certainty. What's certainty? The only thing I know that is certain is death and taxes. But some people

up at the Lab say there are folks up here at Berkeley that would challenge even that.

I'm trying to put some things into this thermometer that I think might be useful information for you to know. The lifetime risk of total cancer incidence expected in the San Francisco Bay Area is about one chance in three. In other words, if most of us have an opportunity to live to the age of seventy, one out of three will have experienced the devastating effects of getting cancer.

One of the highest background sources of contamination that leads to risk is being a smoker and being exposed to average levels of indoor radon.

The nonsmoker exposed to the same level of radon has a risk of about 20 times less than that of a smoker, the smoker's risk for the average level being several chances of a hundred, whereby the risk for a nonsmoker being as low as one chance in a thousand. Still those are high risks.

You will seldom see radon exposures expressed in this way. But I hope that shows you that radon is not a trivial problem. In fact, the National Cancer Institute estimates, and, in fact, the National Academy of Science estimates that one-10th of all lung cancers in the United States is likely to be induced by radon, and 30 percent of the cancers in nonsmokers is induced by radon.

I've also given in this thermometer risk levels of dioxins in foods, PCBs in foods, sharing a room with a smoker for fifty years being several chances in 10,000, cosmic radiation in the area of the summit of Mt. Tamalpais or Mt. Diablo, if you lived there for seventy years continuously you would get 41 millirems per year, and the risk would be on the order of several chances in 10,000.

A frequent flyer traveling a hundred hours per year and continuing that habit for 25 years would have a lifetime risk of a little over one chance in a thousand. Cosmic radiation at sea level, just about where we are now, living there for seventy years, 26 millirems per year, and a risk of about one in a thousand. Air pollution from hazardous chemicals averaged over the State of California is several chances in 10,000.

Where are the estimates from what I've presented in this presentation? Down in the bulb of the thermometer. Is this a significant concern to be worried about? I can't tell you that. That's your judgment to make.

This is probably the most difficult consulting assignment that I've had in my career due to the high levels of outrage, and yet every way I look at the National Tritium Labeling Facility the results consistently come up in terms of being at the bottom of

the thermometer.

This is not a situation that I can, in good conscience, say that is a concern in terms of compliance with regulatory limits. This is certainly below levels at which epidemiological studies could confirm the presence of harm, and it's not something that I would personally have as a high priority of concern in my own personal life.

I told you, I tell it to you straight, I have done so. Tore Straume may well be right that maybe some of the ways that I've couched my information will make both sides mad at me, but I felt obligated to give it to you as straight as I can. Thank you.

MS. DOUGHERTY: Bernd, are you there?

MR. FRANKE: Yes, I am.

MS. DOUGHERTY: I have a couple things. First of all, Nabil, do you want to say anything, Nabil? We've asked Nabil to speak because the City of Berkeley -- of course, he's representing the City here at the Task Force, and he may have a comment for you members.

MR. AL-HADITHY: No. I do, however, want to confirm that we are receiving comments for Bernd on his reports during this month. Hopefully we'll be able to collect that and pass it on to Bernd for review and incorporation of any of the comments he feels are

technically relevant.

We are very concerned about the time, excessive time that Bernd has spent on this project. We're very pleased with the first reports. It was much larger than we had expected.

And we ask people, please, to consider that Bernd is getting a $35,000 contract -- $35,000 to do an inordinate amount of work. So to minimize the amount of direct communication and demands on his time. Thank you.

MS. DOUGHERTY: Okay. I'd like to start with the Task Force members. I am sure you have bazillions of questions, I'm sure you have lots of questions for either of the two consultants. So what I think we can do to try and have order and give everyone a fair chance at the consultant's time is to simply go around the room and each of you address a single question to either consultant.

And then we're going to move on because everybody has so many questions they want to ask, I'm sure. If we could start with Miriam, we have a half an hour. So let's start with Miriam, please. I'm sorry, for Joanna, it's Miriam Ng.

MS. NG: About the nearby residents, I was specifically concerned about what "nearby" meant, you know, because if I am to be concerned about the residents in the area that's close to where this facility is, I

think I'd like it a little more clear as to what "nearby" means.

So that, in fact, say if you said that the nearby residences are, you know, ten houses away, half a mile away, then it may be that we would need to disclose that it was within half a mile of this facility we need to say that you are getting a certain dose of exposure to this radiation. So I was a little unsure as to what "nearby" specifically meant.

MS. DOUGHERTY: Bernd, can you hear that?

MR. FRANKE: Yes, I can.

MS. DOUGHERTY: Both Owen and Bernd, we'd like to give you a chance to answer each question. Each of you can respond, whichever of you would like to start.

MS. NG: I didn't expect a response right away.

MR. FRANKE: Shall we make a round of questions? I can offer an answer quickly. "Nearby residence" is a concept which is specifically defined in the compliance where the maximally exposed should be selected. So that when you make sure that that maximally exposed which is closest to the facility gets levels below the limit, then all the other people being further away, of course, would get much smaller doses.

And I raise the point of what you call the transient receptor, the guy or person being close by the

fence. And I'm encouraged that the Lab has been acting on this. I'm going to review what Owen has presented.

MS. DOUGHERTY: Owen, did you have a comment? And does that answer your question? I'm not sure you answered the question of "nearby" Miriam points out she doesn't need an answer right now. You might try to specifically address her question, what does "nearby" mean.

DR. HOFFMAN: Let me try then to state in my words. I understood perfectly what Bernd had said. That is that for regulatory compliance purposes one usually assumes someone so close, living so long near the facility, that that calculation would represent the worst case situation.

Someone living truly nearby would usually live further away and would usually travel out of the region more frequently than assumed in these calculations.

Nevertheless when one uses the term "nearby" we are talking about anyone who would live near the facility, a near mile or so from that facility would be a nearby resident.

MS. DOUGHERTY: So a mile radius from the facility. Dr. Miller has joined us.

DR. MILLER: No questions.

MS. EVANS: I have a question, but come back to me.

MR. MCGRAW: I'm going to save my time, but I don't think we've answered Miriam's question. I'd like to come

back to that.

MS. PACKARD: I have a couple of questions, and I'm not sure. One of them is one of the speakers raised a question of something -- risks other than cancer risks. Is there any data? Is that ever used in regard to these kinds of exposures?

And I'm thinking particularly of birth defects or mutations. Is that ever used in these kind of calculations of this kind of exposure?

DR. HOFFMAN: Yes, they are. We did not use it in our assessment, only because of our knowledge that typically cancer incidence will dominate over all of the others. But we cannot rule out other genetic disorders because primarily radiation disrupts the DNA, and anything that disrupts the DNA, any illnesses that are manifested from DNA disruption can be manifested.

To the best of my knowledge and I've tried to keep abreast of this, but there is very limited human epidemiological evidence from which one can give quantitative estimates of risk about disorders other than cancer incidence at higher doses, at doses much higher than anything I have here, above doses of 10 rad and higher, which would be thousands of times higher than what we've shown here. There is new evidence to come in to show other diseases that relate to cancer that seem to

have perhaps an immune deficiency origin.

The newest data from the Radiation Research Foundation in Japan finds a correlation of higher doses associated with coronary heart disease and a list of others. What's perplexing is that if one looks at the dose response of these high levels, they mimic the dose responses one sees for cancer.

Given at least the supposition or at least generating the hypothesis that is there is something associated with an immune response connected with DNA disruption, that could be causing these effects.

MS. DOUGHERTY: Bernd, would you like to respond?

MR. FRANKE: Yes. At this point in my review I have to look at all the health effects. And I agree with Owen that radiation is associated with all kinds of potential health effects, and some are very easy to quantify and some are very difficult to quantify, and that the dose response relationship is indeed one of the issues of how much damage for unit dose.

I've been looking at doses, and the concept is once you limit the dose to a certain number, that is what the legal procedure is in this country, you will limit all effects associated with radiation exposure, cancer and non-cancer effects. But I cannot give you a number on it.

MS. PACKARD: One other question. My other

question is --

MS. DUFFY: You're only allowed one right now.

DR. WILLIAMS: I have two questions as well, but my first one, I realized that Dr. Hoffman said in this sampling plan they were looking at, it is not really designed to look at legacies of past emissions.

But nevertheless I am concerned with that legacy, and I'm wondering if the present sampling plan might be modified to at least incorporate some facets that would help describe past legacy so that at least some of those questions might be addressed.

And the question or the thing that I have in mind right now is the soil sample in which I'm looking at HASL-300, and Mr. Franke suggested sampling at various depths.

But I understood him to say that after sampling at these various depths that the soils would be mixed and then a single sample taken from that.

What I would be concerned with is the higher variability that I think might result from that. And I would -- and I wonder why not sample a number of locations and look at the soil profile from the organic layer to the mineral soil, down to plant material, and perhaps even down further to the groundwater and see what the data, looking at the soil profile at different locations, might

reveal.

MR. FRANKE: Maybe I should answer that. If you want to know what you have in your backyard and you just take one core you may get the hot spot or you may miss it. And the reason why I recommend HASL-300 is just to prevent that chance.

And by taking ten cores you are attempting to get a much better picture of the contamination in a given area. So let's say you identify your backyard for sampling. You would take probably ten core samples, you would slice them into pieces 0.5 and .5 to 1 and so forth, and then you would mix the layers which correspond to each other.

That is actually the recommended method by the Lab and sampling programs I've been involved in that are essentially following that procedure in order to minimize uncertainty.

One, of course, can then take each individual one of these ten cores and sample them to determine variability between the sub-core, so to speak, of a given sample location. I believe that's sensible, and I hope that the Lab will follow this recommendation because it makes the numbers much more reliable. But Owen may want to comment on this one.

DR. HOFFMAN: I think whatever questions the panel raises there needs to be a way to address this. Of

course, one of the concerns is that you get the maximum information out with a credible effort, without exhausting all your resources, chasing minor questions but yet ignoring the really big ones.

For EPA Superfund evaluation EPA limits itself to the top two feet of soil and contamination there for hazard ranking evaluations, which I do not believe is appropriate in this case.

But for using the hazard ranking system they would only use soil samples taken from the surface. They would not consider materials in deeper soils to be relevant.

But nevertheless, you as Task Force members express your concerns, and to the extent feasible these concerns should be addressed, but in such a manner that we don't go to the absurd.

The absurd would be applying a technique to all the current sites where soils are envisioned to be sampled that would increase the number of samples from 100 samples to 4,000.

And so if we use these techniques everywhere that's the kind of level of effort increase that would be invoked. But to use it in some of the places to see what differences we see, I think that would be appropriate.

DR. WILLIAMS: I had nothing in mind like 4,000 samples. What I had in mind, if we looked at maybe ten to

twenty sites and looked at the soil profile of those twenty sites, that would give us perhaps a picture of how the water percolates from the organic layer down through the soil into the groundwater.

And there may be surprising differences as you go -- as you look at the soil profile. And that might suggest that there is -- if there is any legacy there I think you might find it under that situation rather than just the top 2 feet.

MS. DOUGHERTY: I just want to comment to all of you Task Force members, note that the consultants are doing their best to speak on their feet to the concerns, but obviously the Lab will take on more of these comments and will be responding in the next meeting to your very important feedback. You may not get a full answer, but we're trying to give everybody a chance to get their basic questions out.

DR. HOFFMAN: Just let me add, it's inappropriate for me, as a consultant in this process to say definitely "yes" or "no". That's the Lab's decision, and they're taking your viewpoints into account.

MR. AL-HADITHY: What would you need to do a legacy monitoring episode? You mentioned that earlier.

MS. DOUGHERTY: Would you repeat that? I think your mike was off.

MR. AL-HADITHY: Carroll's first question was that you were determining current radiation pollution levels in the environment. And you were not studying the legacy. And Carroll's initial part of the question was what would you have to do to do the legacy measurements, legacy exposures.

DR. HOFFMAN: You have to sample in such a manner that you're separating out a signal that's due to ongoing operations versus the signal due to the legacy. One way to do this, and there may be others, but one way to do this is to sample when operations are dormant.

MR. AL-HADITHY: How long would that be dormant for?

DR. HOFFMAN: I don't believe it takes much more than a week or two to purge the signal from ongoing operations.

MS. DOUGHERTY: We began to address your question, kind of a compound question.

DR. WILLIAMS: And I think you could do that not only with soils but possibly with vegetation as well.

MS. DOUGHERTY: Thank you for your feedback.

MR. WHIPPLE: First of all I want to compliment both of you on clear presentations. I want to follow up on this legacy question, just to try to subdivide it into two pieces. It struck me that Bernd's presentation raised

the issue more in the context of the kinds of historical dose reconstructions that have been done around many of the DOE sites.

And the question there is what were the doses ten or twenty years ago when the releases were higher. And that's a question that has been looked at in many sites.

I think, Owen, weren't you talking about a separate question which is, in the Superfund context, what are the present ongoing exposures from releases of ten years ago. And I think those are two separate questions. So I'd like to get both of your responses to the feasibility of addressing either of them.

MS. DOUGHERTY: Just for clarity here, would you just quickly restate each of your questions?

MR. WHIPPLE: Sure. The legacy releases that we're talking about were releases that occurred more than two years ago in Bernd's definition. But there are two different effects that we could talk about. One is what were the doses in those times when the releases were higher, how much were people exposed to.

And Bernd presented some estimates on that, particularly for the neutron doses off the accelerators. The second question, though, that gets into the Superfund issue is are we -- are people near the site experiencing exposures to tritium today from releases ten years ago.

DR. HOFFMAN: Can I field that first? And that is that Bernd has made the distinction, and the distinction is here in this question. This question refers to present day exposures from historic operations of the facility. The next question deals with what were the exposures that resulted from past operations and what are present-day health implications as a result of those historic releases.

So the two issues have been identified and separated. My answer to the last is that the Lab has recognized this. We agree that these are issues and that they are real issues as opposed to regulatory compliance. Those calculations are already underway.

MS. DOUGHERTY: I'm going to play devil's advocate here. Will the Task Force have access to that information and, therefore, the public?

DR. HOFFMAN: The answer is yes.

MS. GEORGE: Are you doing a survey?

MS. DOUGHERTY: Bernd, it's your turn to talk.

MR. FRANKE: I would like to say about the legacy issue that one should look at it from a practical standpoint. Once the facility is running it's very difficult to distinguish what is legacy and what is current operation.

With regard to soil and vegetation, I believe in

groundwater as well, it would be sufficient to assume that what one would find today is due to legacy contamination.

I know that there is some small contribution from current operations which you would find in soil which you would not find if NTLF would not be running, but I believe if one assumes practically that this is all due to legacy one would err on the safe side.

It's more tricky with regard to air monitoring because I believe the dominant exposure is of current operations -- and I don't really understand, quite frankly, how EPA is going to sort that out. Because if they rely on -- they have a ranking system and they would need to figure out what kind of contamination comes from current operation and what comes from legacy.

The only way to define what is the legacy contribution is to measure when NTLF is not operating, but also for a considerable period of time.

So one either assumes what one finds in air is from legacy and deals with the conclusions that arise from the assumption or one tries to subtract the current operation.

And that is a pretty technical and a tricky calculation since all these concerns about releases and so forth. So I don't really know how EPA is going to do this. They may be the best one to say exactly what they'll do to figure this out.

MS. SIHVOLA: Could you explain what type of a survey is being done? Could you explain it more in detail?

MS. DOUGHERTY: Pamela, we'll certainly address that if that's your question.

MS. SIHVOLA: It's not my question. I have a question prepared, but I was interested in finding that out.

MS. DOUGHERTY: We're trying to stay in order, please.

MS. WOOD: I really don't have any questions, but I have a couple of comments that I would like to make.

The EPA is pleased that the findings of Bernd Franke confirmed that our monitoring at the Lawrence Hall of Science is verifiable and therefore credible.

We feel that we will continue doing the sampling for as long as we can. And the issue of increasing the number of monitors is something we agree to be in the Task Force to discuss. But if the number of sampling stations doesn't increase we will continue to take samples there also.

I would like to point out that although the Overhoff system does not seem to be reflecting the data that we look at, you have to keep in mind that there is a silica gel column on the stack which monitors everything

that goes through the stack. So we feel that that in itself is the important part of that system.

What happens in the Overhoff, however you want to deal with that, may be relevant at some point, but presently, because the emissions are so low, we feel that the maximum exposed individual is not at risk.

And regarding the Superfund issues, I really don't want to address that, that's not my expertise. But if you would like to have Phillip Armstrong and Betsy Curnow come to your next meeting to address some of these questions, I can arrange that.

MR. NOLAN: I have a couple of specific questions related, Bernd, to you, and then one to you, Owen, with regard to the sampling plan. Since the Task Force is here --

MS. DUFFY: You only get one question. You're going to have to be really clever.

MR. NOLAN: I've been known to be that way. I'll try. So the question is to both of you folks. Bernd, you have laid out about four particular changes that you would make or additions that you would make to the sampling plan that's on the table for review.

And they include changes in the air sampling that's been discussed, in the different soil sampling techniques, coordination with the Water Quality Control Board, and

also additional sampling at the Calvin Lab on the campus.

If those changes were made to the plan that's on the table now, would you, and would you, Owen, consider them responsive and adequate to meet the intent of a hazard ranking system score by the EPA?

MS. DOUGHERTY: Bernd, would you like to start?

MR. FRANKE: Yes. I think I pointed out that I'm not EPA, so I am not doing the hazard ranking. And, quite frankly, I feel there is some problem associated with that kind of ranking score. I feel that from my perspective I gave suggestions to improve the sampling, and whether that all will be entered in the ranking system I cannot comment on that.

I believe, though, that those recommendations which are made are sensible, that they would improve the information gathered, and I hope that they also address some of the concerns that the public has. So I believe they would be good suggestions. But whether they are all-inclusive for EPA's purpose, I do not know.

DR. HOFFMAN: If the sampling plan were to be revised so that ongoing operations were separated from legacy contamination, in other words current-day potential exposure to that contamination and soil, groundwater, vegetation, et cetera can give rise to public exposures as a result of the cumulative operation of the NTLF path, and

I think that is the information that is directly relevant to the HRS scoring system, and so in that case if that information were to be used I would have no objection to the application of CERCLA and the application of Superfund law and the HRS to the Berkeley site.

MS. DOUGHERTY: Evelyn Fisher?

MS. FISHER: The people in my community were slightly disconcerted with the fact that the Laboratory could not give an accurate inventory picture to us. And while I appreciate Dr. Hoffman's comment that an accurate inventory will never be good enough to calculate the emissions, the people who live near it would like to know that you do know how much you've got on hand and what would happen in the event of a catastrophic concern like an earthquake.

I think -- I guess this is my sociological comment. Scientists, you've got to recognize you've got to communicate with non-scientists.

MS. DOUGHERTY: Do you guys have comments?

MR. FRANKE: Yes. I would like to comment on that. I agree with you that the residents have a right to know how much inventory NTLF has at hand. Now that can only be determined with some uncertainty.

The most appropriate and the upper estimate of the inventory at hand -- but that's not a calculation in which

you envision catastrophic impact, and just -- I would think it would be in the upper limit of the inventory that what would happen in an accident, what happened in routine operation. I believe that the inventory will never be accurate to verify that because it is not designed to do so.

The only way then to find out what is the normal operation is to measure what is being released into the air and to have a good environmental monitoring going on. That cannot be replaced by inventory data.

MS. DOUGHERTY: Owen, I'd like you to speak about that, and to make sure you get your question answered.

DR. HOFFMAN: I agree with Bernd. The public has a right to know. The public should have the best inventory estimate that the Lab is capable of offering. A person could not, however, consider a 20 percent error on the inventory to be unacceptable. However, to use that even with a 10 percent or 5 percent or even 1 percent error and still come up with a reasonable release estimate, it's impossible because the releases are such tiny fractions of the overall inventory at hand. But I may -- in my profession I am a firm advocate of the public right to know what's going on.

MS. DUFFY: To Evelyn's point, 20 percent on a bank account, that error, it sounds like a big error.

Translate it, the 20 percent.

MS. DOUGHERTY: What Pat just said, what Pat was responding to, I believe, was Evelyn's concern, which is a plus or minus 20 or 30 percent. When we see that number and we're looking at our checking account, it looks like a lot, it looks like a huge error. So to Evelyn's question, when she's trying to go back and describe to her community why it's okay that you have a plus or minus 20 or 30 percent on the actual inventory, why. And I think, Owen, what you said is because the amounts are so tiny they can't be measured better than that.

DR. HOFFMAN: It's not the amount, it's doing the mass balance calculation, which is looking at what's on hand, what's lost, what can be accounted for, what goes into the plant, and what comes out of the plant, and then saying that the remainder is indicative of what's going up the stack.

You can't do that because what goes up the stack is such a small, small fraction of what is going in and going out. One more thing, you mentioned scientists have got to learn to communicate to the community.

Other than consulting here, which is the hardest thing I've had to do, the next hardest thing I have to do is translate technical knowledge in a general manner in which other people can understand it. I keep trying hard,

but it's a mountain I've yet to climb.

MR. AL-HADITHY: I have no questions. I do, however, want to make a comment. Many of the reports and the graphs and the results that you've seen stress under normal operations.

Beyond normal operations there are accidents. Accidents can result in release of a few curies to a few hundred curies. Beyond accidents there is a catastrophe potential. A catastrophe potential is what the City Council has based its request on to close the NTLF, such as landslides, the recurrence of a fire in the hills or an earthquake along the fault line. So it's just a matter of putting things in perspective from normal operation, accidents, and catastrophes.

MS. DOUGHERTY: I believe there are some numbers available, I think. Perhaps what we need here is to have those numbers available to the Task Force about what catastrophe would look like and what does that mean. Is that a meaningful thing? Seems like you guys are asking for that. We'll make sure that's next time.

DR. HOFFMAN: Let me just try to answer that the Laboratory does have analyses that they have made that address the potential for catastrophes that involve disruption of the entire on-hand inventory in the event of fires or earthquakes.

I do not have those numbers memorized. I think maybe David McGraw or Phil Williams might be able to address that. Phil is in the back. In fact, Phil, what can you say about that? Get a hold of a mike someplace.

MS. GEORGE: Why did you cut 40 percent of your firefighters force?

MS. DOUGHERTY: We're not taking questions from the audience.

DR. WILLIAMS: I don't have those numbers committed to memory. My recall is that maximum off-site does is very small, on the order of a few millirem, but as you said previously, we'll make all that information available. It has been made available before, but we'll bring it into this forum.

MS. DOUGHERTY: Dr. Williams, who would normally be presenting right now, is not on the agenda. I do want to note that. Because of our time constraints we're not going to hear from him. Pam, I'd like to go back to you. We skipped you. Are you ready for your questions?

MS. EVANS: Yes. I wondered, does Dr. Hoffman agree with Mr. Franke and Greenhouse's recommendation for the preliminary sampling effort around Building 3 for soil and groundwater?

DR. HOFFMAN: Yes. And I've been told that the Lab has taken this seriously as well. And it is currently

undergoing plans for such an analysis. I don't know if it's the Berkeley Lab or the University of California that's going to take those samples. Maybe Paul, you can answer that.

MR. LAVELY: I've submitted a proposal to take samples.

MS. DOUGHERTY: Sue Markland Day, please.

MS. MARKLAND DAY: I have a question about the intermittent emissions. My take from what you were describing is that in order to better estimate those is looking, perhaps, at some different modeling systems.

But I'm curious as to whether in terms of gathering that information similar to a toggle-bolt system, when you know that you're doing an activity that will likely generate emissions, can you not tell your equipment to take a reading then and then not take it at another point or have two different places to take one continually and one intermittently.

MS. DOUGHERTY: Bernd?

MR. FRANKE: Yes. As a matter of fact the Laboratory has such a system in place. It's the Overhoff system, the ionization chamber, and the releases are integrated over one hundred seconds. In other words each minute and a half you get a data point as to how much goes through the thing.

However the uncertainty of that is quite large since there is instrument background. And it is, of course, much more precise to take integrated measurements such as silica gel sampling.

But what I've been focussed on in my review, and I believe Owen Hoffman has responded for the Laboratory, is data from the real-time Overhoff, which will tell you when you have a burst going through. So what I suggest is to continually watch the Overhoff data and to use this and coordinate with the modeling.

And also we have meteorological data which is gathered on an ongoing basis. And if you combine the two you can do that kind of analysis which Owen apparently presented. I have no time to review Owen's data and his approach and his result at this point, so I will not comment on the accuracy of that approach, but I believe it's the right way of addressing this.

DR. HOFFMAN: I agree with that.

MS. DOUGHERTY: Pamela Sihvola, please.

MS. SIHVOLA: I have a technical question for both of you. But I wanted to ask first Bernd, when is he planning to respond to these comments that the City is currently soliciting.

MS. DOUGHERTY: Bernd, did you hear that?

MR. FRANKE: Yes. I understand that Nabil is

collecting comments, and I would appreciate just really to maximize my project here, that this be done by the end of this month of August. And I will incorporate those comments and I will also try to address the other outstanding issues which I identified which are still to be done.

And I believe that I may have some of the reports done by the end of the year, or it really also depends on what the City wants me to do. They're my clients and I will discuss the timing matters with Nabil.

MS. SIHVOLA: My technical question deals with the hazard ranking score. Bernd, you had asked EPA to evaluate a situation where children who go to Lawrence Hall of Science be considered, maybe saying they're full time, but both you and Owen, you both have not read the hazard ranking score very carefully.

Because there is a provision for this calculation for the workers at Lawrence Hall of Science, and a worker is described to be a person working on a property with an area of observed contamination and whose workplace area is on or within 200 feet of the area of observed contamination.

Since Lawrence Hall of Science's monitor has measured in 1995 the radioactive emissions exceeding EPA risk screening concentration was located inside the Hall

of Science all of those several hundred full-time and part-time workers who are currently at Lawrence Hall of Science should be part of both Owen's calculations as well as Bernd's additional request to EPA to calculate the hazard ranking score pertaining to them as well as regarding Melvin Calvin Building 3, which is on central campus at the University of California Berkeley.

There is a day-care center and plenty of students, several thousand, around daily full-time in that facility. So a hazard ranking score for that particular facility should also be calculated separately. So I want to get a comment from both of you to that issue.

MS. DOUGHERTY: Thank you, Pamela. Bernd, if you and Owen are going to comment and I'm also going to ask Paul Lavely to comment since he is the radiation safety officer for the University of California.

MR. FRANKE: First the point Pamela made about the workers, I believe we should really demystify the hazard ranking system. It's a mathematical model which requires certain input data. And you then look into the number of people affected, and at the end ranking is calculated, and it is about a magical number of 28.5, and it goes into the, so to speak, the process of evaluating what should be done about it.

And all I'm saying here is let's demystify the

hazard ranking system and make it transparent, that people understand how these calculations are done and to provide alternative calculations taking into account all the workers, taking into account all the students, and just see how the dice would fall.

And I think that's sensible. And EPA, I believe, has a job to educate the public a little bit about the ranking system. And let's demystify it and make it understandable. And I guess that is part of the problem here, that people don't understand how they do it.

With regard to Calvin, I think that should be looked at separately at different locations, and even if there is some ranking to be done around the Lawrence Hall of Science it certainly is done on a totally different database than we have on Building 3. So let's just look at those two issues separately and do some preliminary sampling around Building 3 and then go on from there.

MS. DOUGHERTY: Thank you, Bernd. Owen, and then Paul Lavely, and then, actually, David, I'm going to ask you to comment as well because you have joint jurisdiction on that.

DR. HOFFMAN: Once again, I find nothing that Bernd said that I disagree with. Again, my issue has to do with what the hazard ranking system is applied to. If it's applied to legacy contamination and exposure today to

materials that have been deposited over a cumulative period of time, then I believe the hazard ranking system is appropriately applied, and I agree with Bernd. It should be demystified and made absolutely transparent so any critical individual can reproduce the calculation for themselves.

If it is applied, though, to an environmental signal that is driven by a licensed operating facility that is operating well within the specifications of that license, I find that to be a misapplication of the hazard ranking. It's outside the purview of the intent of the Superfund law.

MS. DOUGHERTY: I want to just note that Paul is going to speak also as part of you guy's facility. So, please, both of you address it.

MR. LAVELY: Well, I think one of the first things is that the Lawrence Hall of Science is not a DOE site, it's also a University site. So let me make a comment about the staff.

Some years ago we did a study of the staff, 59 full-time staff, and we couldn't find a statistical difference in the urine samples that we took of them for tritium and twenty people who are not in that location nor are they exposed to tritium in their work.

I have a proposal that's sitting on my desk to move

forward with additional continuing sampling of staff who want to volunteer to do that at the Lawrence Hall of Science. I think we'll get some people who volunteer.

And as much as I respect the calculations that Owen has, there is nothing like having results from the actual people who are there that we were concerned about.

And I do think that on occasion we've kind of forgotten that there are a couple of hundred staff people up there all the time, and I've been concerned about them from the beginning.

That's why we did that work a couple of years ago, and that's why I'm looking at continuing that work now, because there has been a continuing concern. I know that it hasn't been mentioned as a part of this because it's not a part of what the EPA looks at as part of Superfund, but it's what I'm going to look at as part of the concern for these workers. That's the first issue.

The second issue having to do with Calvin, I looked at the report, I don't disagree with anything that's in the report. However, I know that this information came about at a very short period of time for its review, and there are some differences.

For one thing, the sample that's taken at the Lawrence Hall of Science is about a hundred meters from the release point. The sample that was taken at the

Calvin Lab was about 3 meters from the release point.

Of course you'd expect a much higher reading when you're 30 times closer. It doesn't dilute as much, it's not taken by the wind as much. The second is the sample that was taken at the Lawrence Hall of Science was taken in free air, somewhat. The sample that was taken at the Calvin Lab was somewhat in a fishbowl effect caused by the shape of the building. Being a round building it has a false wall that goes up that hides the air conditioning and stacks.

The third thing is that those samples were taken at a time when the work done in the building was significantly greater than it is now. The activities that are being used in the building now are well less than 10 percent of what they were up to even five or six years ago.

So while I agree with what's in the report there are some other things. And I think that some samples will be the definitive answer, that and looking at what's going on now.

MS. DOUGHERTY: Again, to respond to Pamela's questions, I think he's responding to you, I hope so.

MR. MCGRAW: I think what we have to keep in mind here is that the hazard ranking system being applied to trying to assess risk is a misapplication of the hazard

ranking system and is a misapplication of what the Superfund HRS is for. And I think Periann will probably speak to that.

What we try to do when we have situations like this is to get as many data points as we can. Paul has done urinalysis up there, we do real environmental sampling and compare that to our predictive models, run those predictive models against other models, and then we compare that to Owen's risk assessment.

And all of that starts to tell us a story. And that story is remarkably consistent. So doing what Pamela is suggesting, first of all would be not appropriate, and it really is a misapplication of what the hazard ranking system is about. I'm all for demystifying it, and I think we're starting to see an emerging pattern here from several different methodologies. And they're all telling us the same thing.

MS. SIHVOLA: I just wanted to say that what I was reading, I'm citing this from the law. This is the Code of Federal Regulations, Title 40, parts 300 to 399, which define the hazard ranking score. So if this is the law, then the law should be followed.

MS. DOUGHERTY: Pamela, would you please give a copy of that to Joanna so she can get the title right? Keith Matthews, please.

MR. AL-HADITHY: Just a point of clarification here, to Paul. The Calvin Lab stopped its major DOE experiments about five years ago, is that correct, when the monitoring was taken down?

MR. LAVELY: It's secondhand. I think the answer is that, yeah, about five years ago the releases -- not the releases, but the work -- decreased by about a factor of ten. The quantities that were being handled decreased by a factor of ten. That's one.

And as I understand from conversations with the people who do the sampling, that at that time the decision was made to either upgrade the sampler that was there or to look at whether there was a need for a sampler based upon the significantly decreased activity of work that's going on in the facility.

The decision was that the type of work and the amount of work that was going on had so radically changed that there was no longer a need for the sampler there. They were going to have to install a new one.

Plus there were questions about how good a sample you were getting because of this bowl effect of the building, whether it was even indicative of what was being released. So as I understand from the people who do the sampling, the decision was to remove the sampling.

And you can in this case -- you probably could look

more at what's available for release. It's a much smaller quantity. It's thousands of times less than NTLF.

MS. SIHVOLA: Do you know what the actual inventory is?

MR. LAVELY: I've seen it. I don't have it in front of me.

MS. SIHVOLA: What is the range?

MS. DOUGHERTY: If you can provide that, that would be great.

MS. WOOD: Regarding the use of the HRS for any kind of risk assessment, that was not what the HRS was designed to do, so using it that way is to be inappropriate. However, I know that there has been a risk assessment done, I believe in 1997, and I think -- I just wanted to point out that the HRS system was never designed to be used as a risk assessment tool. And I think that when Phillip comes and describes to you and demystifies it, hopefully it will be very clear to you that that's not what it was designed to do.

Regarding the risk assessment, the risk assessment was done, I think the last one was 1997, and LBNL did that risk assessment. Whether or not another one needs to be done at this point is something that we should discuss with the Task Force as well as LBNL. But the HRS is not the tool to do risk assessment.

MS. DOUGHERTY: Keith?

MR. MATTHEWS: I don't have any comment other than to say that I'd like to see your analysis done on a wider scale of both the people that work at the facility as well as a good sampling of people in the residential community and on the University campus at large.

MS. DOUGHERTY: Thank you for that suggestion. You don't have any other comments?

Paul Lavely, please.

MR. LAVELY: Thank you. First, perhaps it's not a technical question, but I do think that perhaps one of the things that needs to be mentioned is what a bargain the City has gotten. And I hope the people recognize that the amount of hours that have obviously gone in on Mr. Franke's part, they are reducing him to well below the minimum wage.

MR. FRANKE: I'm crying.

MS. SIHVOLA: Can I remind people that the U.S. dollar is 20 percent more valuable currently in Europe as it was several years ago? I know because I just came back.

MR. LAVELY: Well, I just want to say that the amount of time that's obviously been put into this work for the City far outstrips anything that I've seen for similar efforts, and I know because I've done this type of

work in the past. And this is just a fantastic amount of work that's been done.

I guess the -- rather than having a direct question, I'd like to try and get both of these gentlemen some more information about the Building 3 Calvin Lab, so that I think that there can be a greater understanding.

It's tough to do when you're just looking at sampling results that are on a piece of paper, to know the actual -- what this looks like, how close to the monitor the samplers are, the individual effects of the building and wind. And I know they're both open to that.

I've already given some comments to Mr. Franke and he told me he got them. And I hope they'll be helpful. I'm sending you a copy too, Nabil. And I hope they'll be helpful to him.

MS. DOUGHERTY: Thank you very much. Amy Kyle. Poor Amy sat in the wrong seat tonight.

MS. KYLE: That's what I get for not making it last time. I guess now that we're to the end maybe I can just make a couple comments. One is I think on this question of who we should look at when we're talking about the most exposed or the potentially most affected, regardless of what the HRS says or doesn't say it's a little bit bizarre to hear about people who come even ten or a hundred times a year and not hear about the people who are there every

day, just listening to the presentation.

So I think this question of making sure that in whatever kinds of analyses or estimates or assessments people do that we make sure that we are capturing the people who are there every day. It's really important.

Otherwise it doesn't quite make sense. It doesn't quite make sense to me to look at kids who are there ten times a year. I have a student who works there. And she's there five days a week or four days a week. So I think that's important regardless of this HRS issue.

The second thing I wanted to say is I'm hearing a lot about the legacy question. And we need to find a way to deal with that. And I don't know if that's by adding a few things on to the sampling plan or by listening to what the Lab is doing already or what.

But it seems like this is a thing people need to know about. And we need to find a way to deal with that. And I think the third thing is this question also of what about the earthquake.

It seems like we need to find a way to deal with that too. Because what is it, a 30 percent chance, or something like that, in the next -- maybe it's 70 percent chance in thirty years, something like that.

It's not a remote possibility. And in this group of issues that have to do with the Lab it seems like we

need to find a way to talk about that too.

MS. DOUGHERTY: Periann has something.

MS. WOOD: Just to make a comment, a response to one of the things you said.

The ambient air monitoring we do on the wall of the Lawrence Hall of Science tells us the emissions are very, very low. And that does tell us something about what the exposure will be from a core of people working in that building many hours a day, and that's extremely low. Just to let you know we know that.

MS. SIHVOLA: I wanted to respond. The monitor, which is located currently outside Lawrence Hall of Science, is at the height of three and a half meters. I talked today to the environmental sampling expert in Livermore, and he said usually the samplers that are measuring air at the level of where people are walking or breathing is anywhere from one meter to one and a half, but maximum two meters.

It is clear to me that the EPA's monitor, the intake is too high, and most likely it will not pick up the plume because the vertical depth of the plume will not go that high.

So I think that's one explanation why the Lawrence Hall of Science monitor is not picking up adequate concentrations. And I think that issue needs to be

addressed and I think there should be an independent verification of the appropriateness of the particular monitor, and maybe, you know, various heights for measuring air at that site.

And my question to Periann is also is the monitor inside Lawrence Hall of Science, is it still located there and is it still connected in addition, to the outside monitor.

MS. WOOD: There is not a monitor inside the building, but we have one on the stack side of the building, and we also have one located in the parking lot on the west side.

So we're actually capturing at least two wind directions from the major stack, which is the major source of the emissions there.

And we have been monitoring that for two and a half years, and we have found only very, very low levels in both of those stations.

MS. SIHVOLA: Was the inside monitor physically removed out of the Lawrence Hall of Science?

MS. DOUGHERTY: Can we note that Pamela has a question, and that needs to be addressed. Pamela, also, as I understand, you also asked that we address in the sampling plan the location and the height of the monitor in the Lawrence Hall of Science. Is that correct?

MS. SIHVOLA: I would like to have an independent review of the particular issues of the monitor.

MS. DOUGHERTY: It's quarter after 9:00, and we have ten minutes of public comment we need to allow for. And you guys probably haven't asked near as many questions as you'd like to ask of our two consultants. How would you like to proceed at this point? How would the Task Force members like to proceed?

Do you want to ask Owen and Bernd to come back and continue their presentation? Do you want more time to digest what you've just been told? There is lots of options.

MS. PACKARD: I think my question moves us forward a little bit, and I was wondering how we were going to handle the differences between Mr. Franke's recommendation on widespread, more air monitors and Mr. Hoffman's on fewer.

And I think you used a term about the technical analysis of specific sites, because I have no idea and I'd like them to be able to tell me if it is feasible to do a technical analysis of a potential site, and just how are we going to resolve the differences so we could move forward and get the air quality monitoring going. Because that's the issue.

MS. DOUGHERTY: Thank you. So the question is how

are you guys, Bernd and Owen, going to make recommendations to the Lab and how is the Lab going to respond, et cetera. Carroll?

DR. WILLIAMS: I believe that we've had sufficient input from Dr. Hoffman and Dr. Franke to discuss changes in the sampling plan in various directions. And I would like to move forward now to the public comment period and then follow up the sampling plan at another time.

MS. DOUGHERTY: In your recommendation we need another meeting to talk about the modifications with them together.

MS. NG: Could we talk about picking a date for the next meeting?

MS. DOUGHERTY: Let's make sure everybody is on the same page. Okay. Looks like it. Miriam asked that we pick a date for the next meeting. The first week of the month is out. One of our members has asked specifically that we not look at the first week of the month. That's a holiday day week anyway.

MS. DUFFY: How is the second week?

MS. DOUGHERTY: The 14th of September is a Thursday. Terry points out it's very difficult to get facilities for these meetings. It takes a little more than three weeks to do that. I think we're looking at an October date, second week in October. That gives us 12

October. Could we look at September 14, 21, either one, September 14, September 21? 14 not 21? 14 works for us.

MS. SIHVOLA: I won't be available till the first week in October.

MS. DOUGHERTY: Is Gene able to be here for that? We're trying to make sure you guys have a representative here for the meeting.

The next thing available is the 28th. Pam, you're not available then. Okay. The 28th. Not for Chris. This is going to take us a while. All right. What about the 20th?

MS. MARKLAND DAY: I think you should stay consistent every month. We're never going to get everybody together. It's impossible.

MS. DOUGHERTY: Are we back to the 14th? Okay. 14 September. 14 September, and we will keep our fingers crossed about availability of sites. And we'll let you know. You guys, we'll be in touch with you on that.

MS. DUFFY: Phil Williams will be at the next meeting.

MS. DOUGHERTY: The agenda for the next meeting will include review of these things. We have about ten minutes of public comment. We'd like to make sure we allow for that and allow you guys to listen. Sherie, are you ready to pull names?

In the meantime, while Sherie is getting ready I would like to specifically thank you, Bernd, so much for being with us tonight. We know it's just now early morning in Germany, and we appreciate so much that you're here.

Owen Hoffman, thank you so much for your presentation. Task Force, thank you for your time and attention and for your exquisite respect for another. We really appreciate that. Periann?

MS. WOOD: Do you want anything on the documentation of HRS?

MS. DOUGHERTY: Periann is offering to give us a packet of information from the EPA on the HRS, of how it should be used, how it shouldn't be used, how it's not appropriate to be used, et cetera, and that would be like a packet of information for you guys for the next meeting. Okay. That would be great. Okay. Sherie.

Beginning of public comment period starts now. Thank you all for your time and attention, and we'll see you next month.

MS. RODRIGUEZ: Susan B. Rodriguez, engineer, Plowshare social civil rights activist, 31 years. As the meeting started I watched all of you eating your food and vegetables and fruits, and I thought of the farm workers out on the field and how they're continually being sprayed

and contaminated and how all of us in the room continue to allow it to happen.

But yet we eat the food, we don't even consider blessing them. So to get to the point, in our society under law if a drunk driver was driving through your neighborhood, jeopardizing the community, it is the law, we have the right to take their keys away and put them under citizen's arrest.

Well, we the people, sitting here representing the community, not just within Berkeley but in our society, are continually being treated as guinea pigs. That's what this is about, our children.

I represent the children in our society that will definitely feel the ramifications because of the continuing of this contamination. And as a citizen in the United States I strongly feel that my call is to close down the Lab.

I call for civil disobedience, direct action, and Plowshares action. And, believe me, I'm serious. In 1990 I was an engineer in research and development. I am a specialist in standards, Q/A, Q/C, you name it. All of that is irrelevant. As long as even the smallest amount is being dispersed it is a danger to all of us.

But forget all of you here, especially the old people. You don't give a damn. It's about the children.

And it's unacceptable. And I would like to ask the engineers and the scientists in this room to check Oxford Street and University. Every morning and daily something is being expelled out of the manholes. I'd like to see what that is.

But I'd also like to say, under the Nuremberg principles and international law, it is against those laws to prepare for wanton disruption of a city and nation.

And, as I said, in 1990 I was an engineer, director for cable T.V., I was in Hayward, California, direct line to the mayor, and I infiltrated Physics International in San Leandro, California and did a disarmament action.

And that's where I am a Plowshares activist. And we continue to do disarmament action. And I destroyed 55 of their computers, all their top secret blueprints, and I gave my life for life.

Because, believe me, when you do an action like that you go to ground zero. Now I'm a lecturer, motivational speaker with children and all over the United States.

And, believe me, I've traveled from here to New York and seen the results of contamination in the rural communities with so-called conservative republicans crying over dinner with me on how they were fooled, on how waste treatment facilities and incinerators and the same thing

that's going on with this Lab, they were told they would be brought jobs, they were told their community would economically rise. And you know what's there? Contaminated water. And I have grown men crying in front of me. And there is no jobs.

This Lab needs to be shut down, and I know there is time, but there is no time for the future of our children, so cheerleader, you need to just wait a minute because I am the one that gets the job done.

And I am telling you I am calling for the movement and I've been a leader 31 years for disarmament, civil disobedience and direct action upon this Lab today.

MR. ARENS: Eric Arens. I do have one further thing to say. All the ideas are on the table, and that's the following, that the stack is a dangerous thing. It was put in this unusual place up at the fence, on the back fence of LBNL so the wind would blow whatever comes out of it over the fence.

Also in the proposed sampling plan, it's a big loose leaf binder that LBNL put out, it says that when LBNL and employees go near the stack they have to notify the LBNL radiation safety office. And so why do that if it isn't dangerous?

Now, for Owen Hoffman here, I mean, I'm not arguing with you on the numbers here, but if the danger is down in

the bulb of that thermometer why not just get rid of the stack and let the stuff inside the building or vent -- I mean, something is really fishy here. And that's my comment. Why not get rid of the stack?

MS. BERNARDI: I'm using the rest of his time. Gene Bernardi with the Committee to Minimize Toxic Waste. And I just want to remind all of you that next month will be the four-year anniversary of the Berkeley City Council passing a resolution asking that the National Tritium Labeling Facility be permanently closed.

Two years later in September of 1998, again, they reaffirmed, this is unanimous, that they wanted the National Tritium Labeling Facility closed.

Here we are, four years they've been asking for this, we've been asking for this. And I hear tonight, and Owen Hoffman has said that this sampling plan they called upon because of the HRS, the hazard ranking score, will not work for CERCLA.

They're looking at the legacy contamination, and what you have to do is close the Lab and measure the contamination that's already there from the past emissions.

So let's do that. Let's do what the City of Berkeley asked for four years ago and, again, two years ago, close the Lab and then go out and measure the amount

of contamination that's there from what's already been emitted.

And we now realize that that needs to be done around the Melvin Calvin Lab and probably the Donner Lab as well on the U.C. Berkeley campus. So let's get with it. Forget the sampling plan. Owen Hoffman himself says it's irrelevant. It doesn't apply. It isn't going to work. You're not supposed to be looking at current emission to determine legacy contamination.

MR. FULK: All I can say is that you have to be very careful about what you already have there, and there is still cover up about how serious this is. I'm supposed to sum it up. This is ridiculous to sum up a severe threat like this in something like a minute. Because the threat is not even touched so far.

We just keep talking about cancer, which is done by Ouija Board. If you want to ask embarrassing questions, ask those guys how they produce those slope factors and what comes into this judgment, about the numbers you saw up there, even on cancer.

They don't tell you that it's related to a healthy teenager, they don't tell you that about 10 percent of the ladies in this room are very, very extraordinarily sensitive to radiation. Now I don't know the numbers on other groups, all I know is the data on Caucasians.

But essentially 10 percent of you in this room are extra sensitive and your repair mechanisms are very much at fault, and you are not even taking into account in those by Ouija Board calculations age, and other things besides cancer. It's not even considered.

Cancer calculations, ask to see the numbers. Ask to see how it is done, what the assumptions are, what that biological quality factor really is and why.

Furthermore, very shortly there is going to be a BER 7, which all of these benchmarks are going to be lowered. I bet you ten to one. This threat of lower-level radiation is much worse than you think.

And they don't want the polluters to get worried, so they want to keep calm. But you wait until BER seven is out. BER five put a kink in their gut. BER seven will be worse.

BER is from the Academy of Science group citing the low-level biological effects of low-level radiation that is being sent right now. I don't know whether it is complete or not, but the show is on the road. Because BER is already out of date, and considered wrong.

MR. WOODS: I want to make one last comment that is to the issue of Calvin Lab. I guess many of you don't know in the 1970s I was a University of California student. I come to this group because of that and because

of my exposure around Calvin Lab in the 'seventies. And when I know that we had a problem there and why legacy is so important.

I want you all to be reminded, because I know scientists sometimes are just preoccupied with following their own economic interests and so do regulators and forget the reality.

And that was one thing I heard Julia Butterfly Hill say on Earth Day, and she said your legacy is what you leave behind you. And I might remind you all that the legacy that we leave as a group, as a whole group, and that's including the community here, is what we choose to do and what we choose to leave for the future of our children, for my children, for my two children and for all the children in Berkeley. And I think we need to recognize that the legacy is what you leave.

MS. DUFFY: And that ends the meeting.

(Whereupon the proceedings were adjourned at 9:33 p.m.)

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REPORTER'S CERTIFICATE

I, Joanna Filds, Certified Shorthand Reporter No. 10959 in and for the State of California, hereby certify that the foregoing is a full, true and correct transcript of the proceedings to the best of my ability.

Date:_____ _____

Joanna Filds CSR # 10959